British West Indies Central Sugar Cane Breeding Station, Barbados.

SIXTH ANNUAL REPORT

ENDING SEPTEMBER 30, 1939.

Advocate Co., Ltd.,—Printers to the Government of Barbados.

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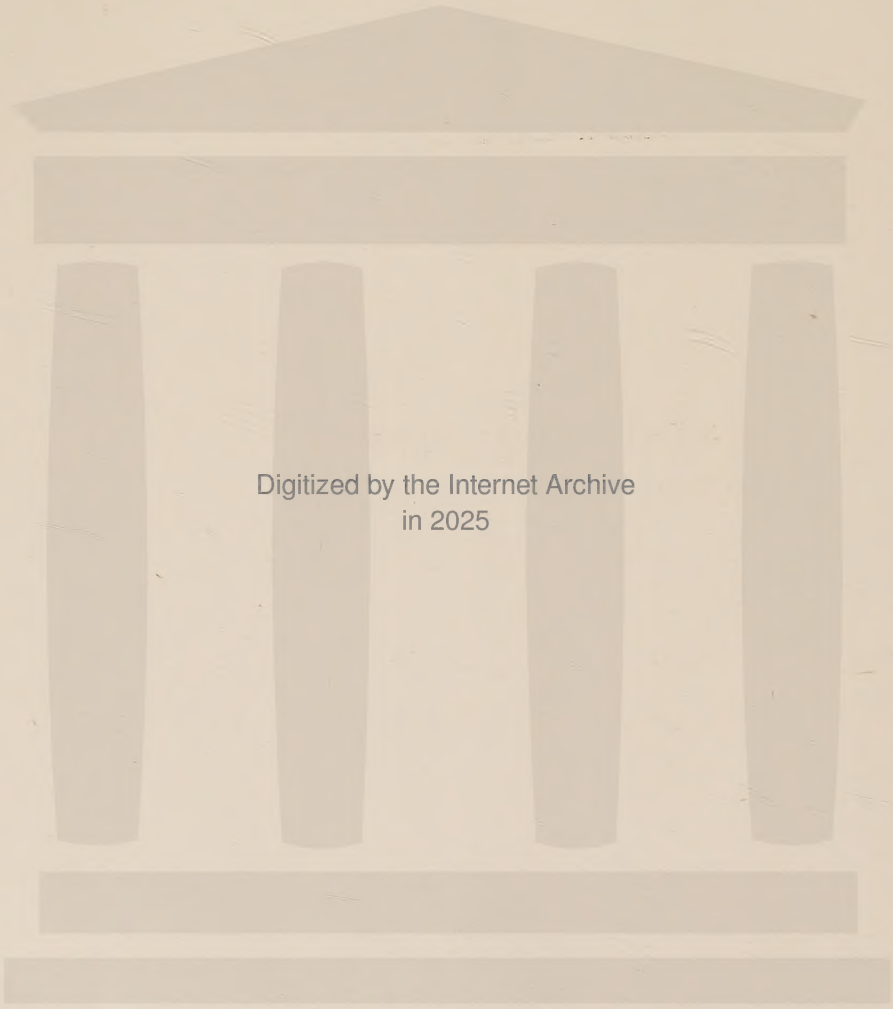

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BRITISH WEST INDIES CENTRAL SUGAR CANE BREEDING STATION.

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Geneticist—A. E. S. McIntosh, B.Sc., Ph.D., (Edin.)

Assistant Botanist—D. M. Hanschell, B.Sc., A.I.C.T.A.

Agricultural Assistant—A. D. Herbert, D.I.C.T.A.

„ „ —J. R. Peterkin.

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I. FOREWORD.

Financial.

It is gratifying to record that in response to the resolution passed at the seventh meeting of the Advisory Committee the subscribing colonies have raised their annual contributions to the Station from £2,000 to £2,500. It is considered that this income will cover all future needs and will enable the work of the Station to proceed unimpeded by financial considerations.

2. At the eighth meeting of the Advisory Committee the estimated annual expenditure for the seventh financial year together with a scheme for capital expenditure over this period was considered and approved.

Visits.

3. During the year under review the Geneticist paid a second visit to Jamaica and then proceeded to Louisiana where he represented the Station at the Sixth Congress of the International Society of Sugar Cane Technologists. The visit to Jamaica is detailed in Bulletin No. 18 of the Station whilst a report on the visit to Louisiana is included in Appendix III to this report. It will be noted from this report that the visit of the Geneticist to Louisiana will prove of great value since it will result in an extension of the promising nobilisation work of the Station by the importation from the United States of America of valuable wild cane breeding material described at the Congress.

Technical.

4. The work of the Station continues to make satisfactory progress. The first batches of seedlings from the Station received by the Colonies after quarantine in Trinidad have now completed their first season of test in most colonies. Full details of the results of these trials have been received, to date, from Trinidad only, and it is noted that the variety B.3439 has shown considerable promise. The authorities of the Plant Quarantine Station have overcome certain major difficulties in the technique of quarantine and seedlings are now being sent out regularly to the contributing colonies. These new seedlings should be multiplied as rapidly as possible and allocated to variety trials on the lines recommended by the Station.

5. During the season twenty-three new seedlings were despatched to the Plant Quarantine Station and, of these, two noble canes—B.3521 and B.3540—are considered promising and two nobilised canes—B.37161 and B.37181—appear to merit especial consideration.

6. The seedling trials conducted during the season in Barbados indicate that B.3419, B.35187 and B.35245 are outstanding. B.35187 gave exceedingly high tonnages and in all tests in Barbados, to date, has proved resistant to mosaic disease. Unfortunately, according to a recent report from Jamaica, it has not proved to be resistant to mosaic disease in that island.

7. All seedling testing is emphasising the value of nobilisation work in producing promising types and it is evident that the future policy of the Station will be to discontinue purely noble-cane breeding and to concentrate on nobilisation. In this connection, it must be recorded that further importation of wild cane material, collected recently by the United States Government, is to be made in order to expand this nobilisation work. This expansion will mean that projects which are not considered to have immediate practical value such as investigations into cane rotting and ratooning will be postponed for the time being.

8. The mosaic disease resistance tests have been greatly expanded so that seedlings are now tested at an early stage and susceptible types eliminated These tests will also yield information on the inheritance of mosaic disease resistance. If further reports verify that the variety B.35187 is susceptible to mosaic in Jamaica it will prove that the strain of mosaic in that colony is different and probably more virulent than the Barbados strain so that these tests will not be of direct value to Jamaica.

Eighth Meeting of the Advisory Committee, Barbados, May, 1939.

9. At this meeting, in addition to matters already referred to, the possibility of expediting the passage through quarantine of outstanding seedlings was considered. Another item discussed was the policy to be adopted regarding the export of new commercial seedlings and action was taken which will safeguard the interests of the contributing colonies. The investigations into varietal resistance to froghopper in Trinidad were considered from a memorandum submitted by Mr. Fennah. This memorandum indicated that the work so far accomplished was so promising as to warrant continued and more intensive investigation. The Station despatched to Trinidad a third consignment of fuzz and the seedlings from this consignment will serve as further material for these investigations.

Personnel.

10. Mr. O. T. Faulkner, C.M.G., attended the eighth meeting of the Committee in Barbados as the representative of the Imperial College of Tropical Agriculture, and it is already evident that his extensive knowledge of tropical agriculture will be of the greatest value to the deliberations of the Committee.

11. On October 1, 1938, Mr. D. M. Hanschell who is a graduate in agriculture with honours in Botany of Edinburgh University succeeded Mr. G. C. Stevenson as Assistant Botanist to the Station. Prior to his appointment, Mr. Hanschell attended the one year's post graduate course at the Imperial College of Tropical Agriculture and served a further year at the College as Student Demonstrator.

S. J. SAINT,
Director of Agriculture,
Barbados,
Chairman of Advisory Committee.

British West Indies Central Sugar Cane Breeding Station

REPORT FOR THE YEAR ENDING 30TH SEPTEMBER, 1939.

II. SUGAR CANE BREEDING, SEEDLING SELECTION AND TRIALS.

(i) SUGAR CANE BREEDING—B.41' SERIES.

Sugar cane breeding was carried out at Lion Castle from October to December, 1939.

2. All breeding work consisted in crossing, the usual routine lantern method predominating. A further experiment was made in the use of the Hawaiian method. This was essentially a repetition of last season's unsuccessful attempt except that this season a stronger solution was used to feed the cut arrows and the crosses being made were isolated in a humid gully exposed for a considerable part of the day to direct sunlight. This situation, it was considered, might remedy the possible defects of the old sugar boiling house used last season in that humidities and light values were higher. Six crosses were made under these conditions, but the method proved a failure, the solution under the conditions being unable to keep the parent arrows alive sufficiently long to admit of flowering and seed maturation. It would appear from these experiments that the Hawaiian method is not suited to the conditions prevailing in these experiments.

3. The fuzz from the lanterns was sown in boxes. The season was one favouring heavy arrowing and there was no shortage of material for crossing work.

(ii) SEEDLING RAISING, POTTING AND PLANTING IN FIELD NURSERY—B.41' SERIES.

4. The usual sowing and potting methods were used.

5. Sowing was done from December to January and potting during February. In March and April, potted seedlings were planted in the field nursery where they were irrigated to establish them.

6. Table I shows under group heads the numbers of seedlings germinated from the sowings, potted and planted into the field nursery.

TABLE I.*

Numbers of Seedlings in each Group Germinated, Potted and Planted in Field Nursery.

Group.	No. crosses.	No. germinated.	No. potted.	No. planted in field nursery.
Saccharum officinarum *S. spontaneum*	18	18,097	9,852	6,516
(i) Java 3rd nobilisation....	8	1,783	1,353	1,120
4th „	11	12,794	2,985	2,132
5th „	12	2,130	1,217	868
(ii) India				
2nd „	3	1,545	1,192	1,080
(iii) Celebes				
3rd „	6	714	503	446
S. barberi				
2nd „	1	62	48	30
3rd „	2	875	677	581
S. sinense				
2nd „	3	78	57	47
Crosses involving several *Saccharum* species	14	5,192	3,267	2,662
Totals	78	43,270	21,151	15,482

7. It is to be noted that in the nursery plantings the proportion of nobilised to purely noble seedlings is almost two-thirds. This is a much larger proportion than in previous years and is due to the fact that the nobilisation work has been taken to such a stage as to provide many exceedingly promising commercial seedlings. This feature is referred to later.

* Details for the crosses comprising these groups are given in Appendix I to this report.

(iii) PLANTING THE FIRST YEAR SEEDLING TRIAL—B.40' SERIES.

8. This series was bred in 1937, planted in the field nursery in March and April 1938 and selections from the field nursery planted in the First Year Seedling Trial in October of the year under review. This trial will be reaped in 1940. Details for each of the crosses planted are given in Appendix II. A summary of this Appendix is given in Table II below.

TABLE II.

Numbers of Crosses and Seedlings in each Group planted in the First Year Seedling Trial—October, 1938.

Group	No. crosses	No. of seedlings planted in First Year Seedling Trial—Oct., 1938
Noble	7	3,540
Nobilisations:		
Sacc. spontaneum (Java)		
(a) 3rd degree	1	46
(b) 4th „	5	897
(c) 5th „	9	2,482
Sacc. spontaneum (India)		
(a) 2nd degree	1	258
Sacc. spontaneum (Celebes)		
(a) 3rd degree	1	49
Sacc. spontaneum (Java-India)		
(a) 4th degree	1	998
Sacc. barberi		
(a) 2nd degree	1	104
(b) 3rd „	2	110
Sacc. sinense		
(a) 1st degree	2	7
(b) 2nd „	1	1
Mixed Derivations	6	725
Totals	37	9,217

9. The usual lay-outs were employed in planting this trial.

(iv) RESULTS OF REAPING FIRST YEAR SEEDLING TRIALS—B.39' SERIES.

10. These were bred in 1936, planted into the field nursery in April, 1937, and from this into the First Year Seedling Trial in October, 1937.

11. In presenting the results, the several groups are treated separately.

12. (a) *Proven and Semi-Proven Crosses.* These consist of populations of seedlings derived from crosses between noble parents. These crosses have by previous test been shown to give populations of seedlings with high average values in features upon which selection is based e.g. weight and sucrose percentage. Each population consists of a block of seedlings, there being no longer any intention of comparing populations. The seedlings are cut, bundled and laid out for inspection and field selections made. Juice qualities are obtained by taking twelve Zeiss Hand Refractometer readings: three from each of four canes in each field selected seedling. Final selections are made when all are reaped.

13. This group is divided in (1) early and (2) late; the former comprising seedlings from parents which tend to mature early, the latter seedlings from parents which mature later. They are cut early and late in crop respectively.

14. Table III gives details of field and final selections.

TABLE III.

First Year Seedlings, B.39' Series. Field and Final Selections from Proven and Semi-Proven Crosses.

(1) EARLY GROUP.

Cross	No. reaped	No. selected in field	Percentage field selection	No. finally selected	Percentage final selection
Ba.11569 x B.417	586	32	5.4	15	2.5
„ x B.6835	298	24	8.0	4	1.3
„ x B.6450	150	11	7.3	3	2.0
„ x Q.813	144	7	5.0	4	3.0
„ x B.693	113	8	7.1	1	0.9
„ x B.603	431	32	7.4	10	2.3
B.3013 x B.2935	150	20	13.3	13	8.7

TABLE III.—*(Concluded).*

(2) LATE GROUP.

Cross	No. reaped	No. selected in field	Percentage field selection	No. finally selected	Percentage final selection
Ba.11569 x B.H.10(12)	1598	55	3.4	18	1.1
„ x Ba.8069	475	34	7.2	10	2.1
„ x B.603	500	30	6.0	5	1.0
„ x B.693	100	2	2.0	2	2.0
„ x B.6450	152	8	5.3	5	3.3
B.3013 x B.2935	222	17	7.9	10	4.5
B.3138 x B.2935	30	1	3.3	0	0.0

15. The cross—B.3013 x B.2935 appeared to be outstanding and will have larger populations planted in future.

16. (b) *Proven Nobilisations.* These are crosses which previous tests in the experimental cross group (see below) have shown to produce seedling populations of high standard. Like the crosses in the proven cross group, the populations are planted in blocks and the selection procedure is similar.

17. Selection details are given in Table IV.

TABLE IV.

First Year Seedlings, B.39′ Series. Field and Final Selections from Proven Nobilisation Group.

Cross.	Derivation	No. reaped.	No. selected in field.	Percentage field selection.	No. finally selected	Percentage final selection.
B.3013 x P.O.J.2878	4th Glagah nobilisation	228	32	14.0	15	6.6
M.I.20 x B.6835	4th Glagah nobilisation	68	1	1.4	1	1.4
B.3172 x B.2935	5th Glagah nobilisation	83	9	10.8	5	6.0
B.3215 x B.H.10(12)	5th Glagah nobilisation	108	13	12.0	7	6.5
B.3365 x B.2935	3rd Chunnee nobilisation	129	16	12.4	8	6.2

18. A high occurrence of arrowing accounted for the low selections in the cross—M.I.20 x B.6835. For this reason it will be discarded. It is of interest to note the much higher percentage final selections in the other crosses noted in Table IV as compared with those in Table III. This, despite a similar selection procedure and standards being adopted in both cases. It is becoming clear that the best results are now accruing from the nobilisation work and the policy will be to extend this part of the breeding at the expense of the purely noble-cane breeding.

19. (c) *Experimental Crosses.* At present this group contains nobilised seedlings only. The object of the trial is twofold, i.e. (1) to compare crosses by comparing their progenies and (2) to provide possible commercial seedlings. With a view to rendering legitimate a comparison of crosses, any one seedling in this group is inserted at random on a plan and planted in the field accordingly. It follows that the seedlings of each and every cross are scattered throughout the test area. For purposes of comparison between crosses, for every seedling the following data is obtained at reaping:—(1) weight (2) number canes (3) length and width of an average cane (4) percentage arrowing and (5) juice brix value. The best of these crosses are subsequently promoted to the proven nobilisation group.

20. Possible commercial seedlings are also selected during reaping. In this group, 2,132 seedlings were reaped, 148 selected in the field and 59 finally selected; thus giving a 2.8 per cent final selection. The per cent final selection figures for individual crosses varied from 0% to 22%. These selection figures for the various crosses tested are used in conjunction with the detailed data mentioned above in assessing the value of the crosses and in guiding the breeding work.

21. (d) *Early Nobilisations.* These are seedlings derived from crosses which represent first and second degrees of nobilisation of wild species. The seedlings themselves are not expected to have any immediate commercial value, but selections are made chiefly to serve as parent material for further nobilisation work. Occasionally potential commercial seedlings are produced, but these are much in the minority.

22. Two hundred and ninety-three seedlings derived from early nobilisations were reaped and fifteen finally selected.

(v) PROGRESS WITH SEEDLINGS OF THE B.38' SERIES.

23. (i) *Noble Cane Seedlings.* In all, 99 of these were selected from the proven and semi-proven groups reaped during the 1938 crop. These were multiplied at Codrington Experiment Station until November when all were planted in plots at Dodds; these plots to serve for multiplication and gumming disease resistance tests. The survivors from these tests will be planted in Second Year Trials during the season 1939-41.

24. (ii) *Nobilisations.* In all, 121 nobilised seedlings were selected from the experimental cross group in 1938. These were multiplied at Codrington Experiment Station during 1938 and in October from these multiplication plots, 75 were selected and allocated to the Central Sugar Cane Breeding Station Second Year Trial at Codrington for the season 1938—40 as follows:—(a) thick-cane trial (standards—B.2935, P.O.J.2878)—43 seedlings and (b) thin-cane trial (standard—Co.213)—32 seedlings.

25. Sixteen early nobilisations selected in 1938 were multiplied during the year and planted in November at Lion Castle to serve as parents in further nobilisation work.

(vi) PROGRESS WITH SEEDLINGS OF THE B.37' SERIES.

26. (i) *Noble-cane Seedlings.* These were selected in 1937, multiplied at Codrington and in November planted at Dodds for further multiplication, gumming disease resistance tests and minor selection.

27. Of an original total of 112 seedlings, 56 were eliminated on account of poor appearance in the field or susceptibility to gumming disease. The remaining 56 were planted in Second Year Trials for season 1938—40,—22 being placed in the early group and 34 in the late group.

28. (ii) *Nobilisations.* The selections from the multiplication plots at Codrington in October 1937 were planted in a special Second Year Trial, styled the Central Sugar Cane Breeding Station Second Year Trial. This trial was reaped in 1939. It was divided into a thick, and a thin-cane trial, the standards in the former being B.2935 and P.O.J.2878 and in the latter, Co.213. The performance of standards and selected seedlings are noted in Table V.

TABLE V.

Central Sugar Cane Breeding Station Second Year Trial B.37' Series (Nobilisations) Codrington 1937-39. Performances of Standards and Selected Seedlings. (The Figures given are Means of Four Plots.)

(a) Thick-Cane Trial (32 Seedlings Tested).

Variety of seedling.	No. of Canes.	Percentage arrowing	Brix°	Weight tons per acre.	Significant difference in weight between plot means Tons per acre.
B.2935	105	0	19.5	38.56	
P.O.J.2878	152	20	20.3	37.26	
*B.37181	155	0	19.4	55.21	
B.37172	181	36	21.5	46.60	
*B.37157	139	1	19.4	45.23	
*B.3371	160	3	21.2	40.60	±8.47
B.37193	209	0	20.9	38.99	
B.37219	130	0	20.1	37.19	
B.37163	105	1	19.4	36.55	
B.37154	95	0	23.2	33.60	
B.37164	118	0	20.3	33.46	

(b) Thin-Cane Trial (17 Seedlings Tested).

Variety of seedling	No. of Canes	Percentage arrowing	Brix°	Weight tons per acre	Significant difference in weight between plot means Tons per acre
Co. 213	299	61	16.7	43.24	
*B.37161	169	1	18.7	67.94	
B.37175	164	14	19.4	51.21	
B.37184	232	3	18.5	50.12	
B.37162	230	6	15.6	49.05	
B.37259	234	0	18.1	48.69	±7.97
B.37174	240	31	17.3	48.62	
B.37226	175	8	16.3	46.18	
B.37176	225	3	17.8	43.52	
B.37227	175	6	17.8	41.94	
B.37224	225	25	19.7	37.49	

29. The seedlings marked with an asterisk are to be further tested under Barbados conditions in Select Seedling Trials and Maturity Experiments. All are to be planted in the breeding plots at Lion Castle to serve as parent material and also in mosaic disease resistance test plots.

30. It is evident from the data given in Table V that some of the selected seedlings are very promising for Barbados; this applies especially to B.37161 and B.37181. This Second Year Trial goes to emphasise the potential value of the nobilisation work for Barbados.

(vii) SECOND YEAR SEEDLING TRIALS—NOBLE-CANE SEEDLINGS.

31. (i) *B.35' Series—First Ratoons.* These were cut as plant canes at Dodds and Todds during the 1938 crop. The plots of the seedlings then selected were cut as first ratoons at Todds (the high rainfall station) during the 1939 crop.

32. The cane yields and juice brix values are given in Table VI.

TABLE VI.

B.35' Series (Noble-Cane Seedlings). Cane Yields and Juice Brix Values for Standards and Selected Seedlings as Plants (1938) and First Ratoons (1939).

Seedling	Yield—Tons per Acre			Brix.		
	Plants (1938)	1st Ratoons (1939)	Total	Plants (1938)	1st Ratoons (1939)	Average
B.726	35.32	46.33	81.65	22.3	22.8	22.6
B.H.10(12)	36.58	48.28	84.86	20.5	20.7	20.6
B.3518	39.20	38.88	78.08	21.5	20.6	21.1
B.3520	37.00	42.12	79.12	21.7	20.5	21.1
B.3521	44.71	49.57	93.28	21.5	20.9	21.2
B.3525	41.15	44.06	85.21	21.6	22.0	21.8
B.3540	47.30	51.19	98.49	21.2	20.7	21.0

33. Both B.3521 and B.3540 are promising and will be further tested.

34. (ii) *B.31' Series—Second Ratoons.* These were reaped as plant canes at Dodds and Todds in 1937. In 1938 and 1939, the plots of those selected in 1937 were cut at Todds as first and second ratoons respectively.

35. The cane yields and brix values for the three crops are given in Table VII.

TABLE VII.

B.34′ Series (Noble-Cane Seedlings). Cane Yields and Juice Brix Values for Standards and Selected Seedlings for Three Crops.

Group: Seedling	Yield—Tons per Acre				Brix			
	Plants 1937	1st R. 1938	2nd R. 1939	Total	Plants 1937	1st R. 1938	2nd R. 1939	Average
Early:								
B.726	46.98	40.18	37.81	124.97	20.20	23.50	23.40	22.37
B.H.10(12)....	40.66	41.15	35.32	117.13	19.27	23.70	22.60	21.86
B.3419	52.55	46.66	42.12	141.33	19.42	23.10	23.50	22.01
B.3429	47.17	38.23	29.39	114.79	19.95	23.00	21.90	21.62
B.3439	44.97	48.28	47.82	141.07	20.50	24.50	22.90	22.63
Late:								
B.H.10(12)....	43.09	42.77	34.99	120.85	22.00	23.60	23.10	22.90
B.3461	47.21	45.36	37.58	130.15	21.20	22.80	22.10	22.03
B.3464	61.04	48.40	45.68	155.12	20.40	20.40	21.50	20.77
B.3479	51.55	46.00	39.85	137.40	20.50	21.90	21.60	**21.33**
B.3482	49.86	37.91	28.93	116.70	21.20	22.70	22.10	22.00

36. In the above Table VII, the terms "early" and "late" under the group head mean that standards and seedlings appearing under them, were, as plant canes, reaped early and late in crop respectively. It can be seen that in the *early* group both B.3419 and B.3439 are appreciably superior to the standards. B.3419 is definitely promising for red soil estates. B.3439 gives very high ratoon yields. It is a rather thin-cane, erect seedling which arrows profusely. Nevertheless, it has excellent juice qualities and would appear to ratoon successfully over a long period. B.3429 was inferior to the standards and will be discarded.

37. In the *late* group B.3464 gave high cane yields, but the juice quality was poor and its canes tended to rot readily. B.3461 and B.3479 gave good cane yields but their juice qualities were poor. B.3482 was inferior to the standards. All the seedlings tested in the late group will be discarded.

38. The seedlings of this B.34′ series were reaped as plant canes in the Select Seedling Trials in 1939 and their performances are noted in the following section.

(viii) SELECT SEEDLING AND CO-OPERATIVE VARIETY TRIALS —B.35′, B.34′, B.33′, B.31′ AND B.30′ SERIES.

A. THE SEEDLINGS TESTED.

(1) Select Seedlings Trials.

Plant Canes	....	B.3307, B.3419, B.3429, B.3461, B.3464, B.3479, B. 3482, B.35187, B.35245.
First Ratoons	....	B.3013, B.3127, B.3267, B.3307, B.3327, B.3439.

(2) Variety Trials.

Plant Canes	....	B.3013, B.3127, B.3439.
First Ratoons	....	B.3013, B.3127.
Second „	....	B.3013.
Third „	....	B.3013.

B. AN ECOLOGICAL CLASSIFICATION OF THE TRIALS.

39. The classification is similar to that used in recent years and is as follows:—

A. Black and sandy coral limestone soils where average seasonal rainfall is low. On account of low rainfall, ratooning is difficult and cane tonnages are usually low. Stations in this category were:—

(a) Select Seedling Trials

Plant Canes	....	Ruby, Husbands.

(b) Variety Trials.

Plant Canes	....	Springhall, Balls, Grazettes, Sandford, Foursquare, Mangrove.
First Ratoons	....	Searles, Fairy Valley, Haymans, Small Ridge.

B. Black coral limestone soils of low-intermediate rainfall. On account of a rainfall better than that in Category A, a certain amount of ratooning is practised. The extent of ratooning would increase, were stronger ratooning seedlings available. Stations in this category were:—

(a) Select Seedling Trials.

Plant Canes	....	Halton, Frere Pilgrim.

(b) Variety Trials.

Plant Canes	....	Bourbon, Edgecumbe, Lower Estate, Warrens.

C. Valley deep black coral limestone soil area, low-intermediate rainfall. This area may suffer periodic poor soil aeration. Soils, especially subsoils, tend to heavy texture, and root diseases are commonest here. Varieties resistant to the root disease complex are necessary here. A considerable percentage of this area is ratooned. Stations in this category were:—

(a) Select Seedling Trials.

Plant Canes	....	Hampton.
First Ratoons	....	Bulkeley.

(b) Variety Trials.

Plant Canes	....	Hannays, Constant.
First Ratoons	....	Buttals.

D. Red coral limestone area, intermediate to high rainfall. One to four ratoon crops are grown here.
Stations in this category were:—

(a) Select Seedling Trials.		
Plant Canes	....	Mount Brevitor, Henley, Mount Wilton.
First Ratoons	....	Pool, Drax Hall, Rock Hall.
(b) Variety Trials.		
Plant Canes	....	Colleton, Groves, Woodland, Ashford.
First Ratoons	....	Hopewell, Andrews, Bakers, Locust Hall, Guinea.
Second Ratoons	....	Society, Blowers, Cliff, Claybury.
Third Ratoons	....	Mount Wilton.

C. RAINFALL DURING THE SEASON.

40. The average monthly rainfall for season 1938-39, derived from returns from numerous plantations throughout the island, is shown below and compared with similar figures for the eighteen year period from season 1920-21 to 1937-38.

MONTH AND RAINFALL IN INCHES.

Month.	Seasons.	
	1938—39	1920/21—1937/38
January	3.26	3.38
February	2.49	1.86
March	2.02	1.57
April	1.19	1.67
May	3.46	1.91
June	4.37	4.48
July	6.79	6.40
August	8.81	6.19
September	10.58	7.22
October	10.42	7.37
November	28.09	8.55
December	6.89	4.03
January	2.27	3.38
February	3.19	1.86
March	1.25	1.57
Totals	95.08	61.44

41. It can be seen that the season was one of excessive rainfall: more especially from August to December. The May and June rains following the drier months of February to April favoured heavy stooling and early growth of the shoots in the stools. From July onwards rain was plentiful, in fact excessive in November. Growth was excellent and heavy cane tonnages were reaped throughout the island. Juice ripening was slow at first but later more rapid and excellent juices were obtained.

D. RESULTS OF THE TRIALS.

42. In Select Seedling Plant Cane Trials, the following routine data is obtained at each trial:—(1) cane tonnage (2) number of rotten canes (3) complete cane chemical analyses from a plot sample bundle from one of the plots and sucrose per cent in juice from a sample bundle from each of the remaining plots and (4) a calculation of the saccharose yield per acre. Statistical analyses of cane tonnages and sucrose per cent in juice are made.

43. In Select Seedling Ratoon Trials, cane tonnages, number of rotten canes and hand refractometer brixes are obtained.

44. In Variety Trials, cane tonnages and hand refractometer brixes are obtained.

45. The salient results are presented in a series of Figures (Figs. I—V). In these Figures are given, for plant cane Select Seedling Trials, the calculated yield of saccharose per acre and for ratoon Select Seedling Trials and Variety Trials, the tonnage of cane per acre. The small lines alongside the two last named represent established statistical significant differences in tonnages between seedlings. Other relevant data is given in the text below.

46. The results for the various categories are considered.

Category A. (Fig. I).

47. In this category two plant cane Select Seedling Trials, six plant cane and four first ratoon Variety Trials were reaped.

48. In the plant cane Variety Trials the new seedling B.3439 was compared with the standard, B.2935. The figure shows, for this series of trials, that B.2935 appreciably outyielded B.3439 in cane tonnage: the actual averages for the six stations being, B.2935—39.12 tons per acre and B.3439—33.40 tons per acre. On the other hand the average juice brix values were B.3439—21.2 and B.2935—18.5. With regard to cane tonnage, there can be no doubt that the unusually high and well distributed rainfall was relatively more favourable to the standard than to the shorter season type—B.3439. It is felt that with rainfall around or less than average, B.3439 would equal B.2935 in tonnage. The high juice quality of B.3439 coupled with a high fibre content are both very desirable qualities in an early variety in this category, allowing as they do an earlier start to crop and providing an adequate supply of megass for fuel. While these results are disappointing from the cane yield point of view, it is considered that a final judgment on B.3439 should await further plant cane and ratoon trials in this category.

49. In the ratoon Variety Trial, at Haymans and Fairy Valley—the drier estates—B.2935 was emphatically superior in cane yield to both B.726 and B.3127. This was also the case in the plant canes, reaped in 1938, so that, in spite of both B.726 and B.3127 having juices superior to B.2935, it can be confidently stated that the sugar yields per acre of B.2935 are greater than that of B.726 and B.3127. At the wetter stations—Searles and Small Ridge—the tonnage differences are not so marked. The average total plant cane and ratoon yields and brix figures for these two stations are given here:—

	Yields — plants plus ratoons — tons per acre.	*Brix.*
B.2935	63.22	21.9
B.726	53.12	24.6
B.3127	54.23	24.5

FIG I. CATEGORY A.

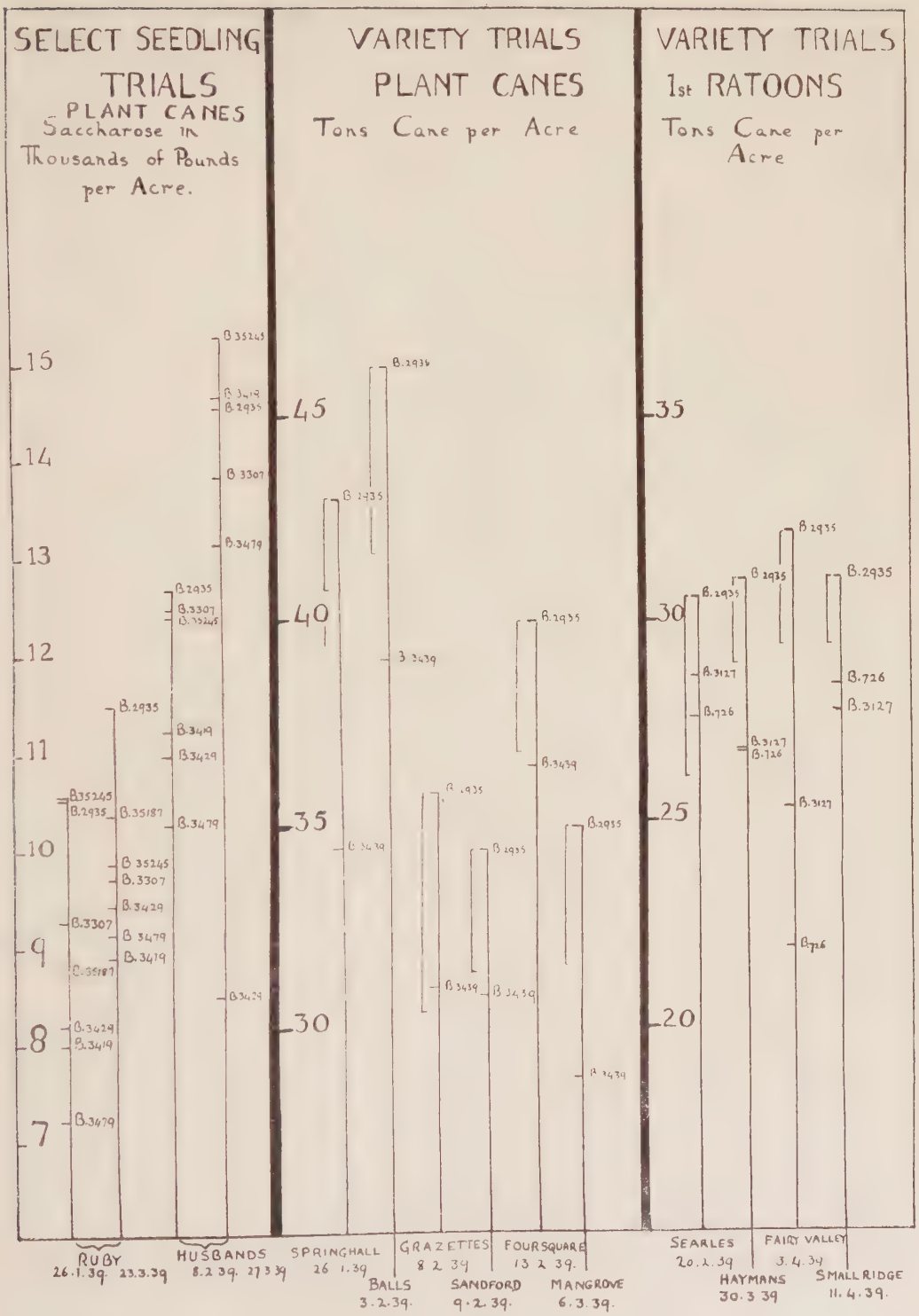
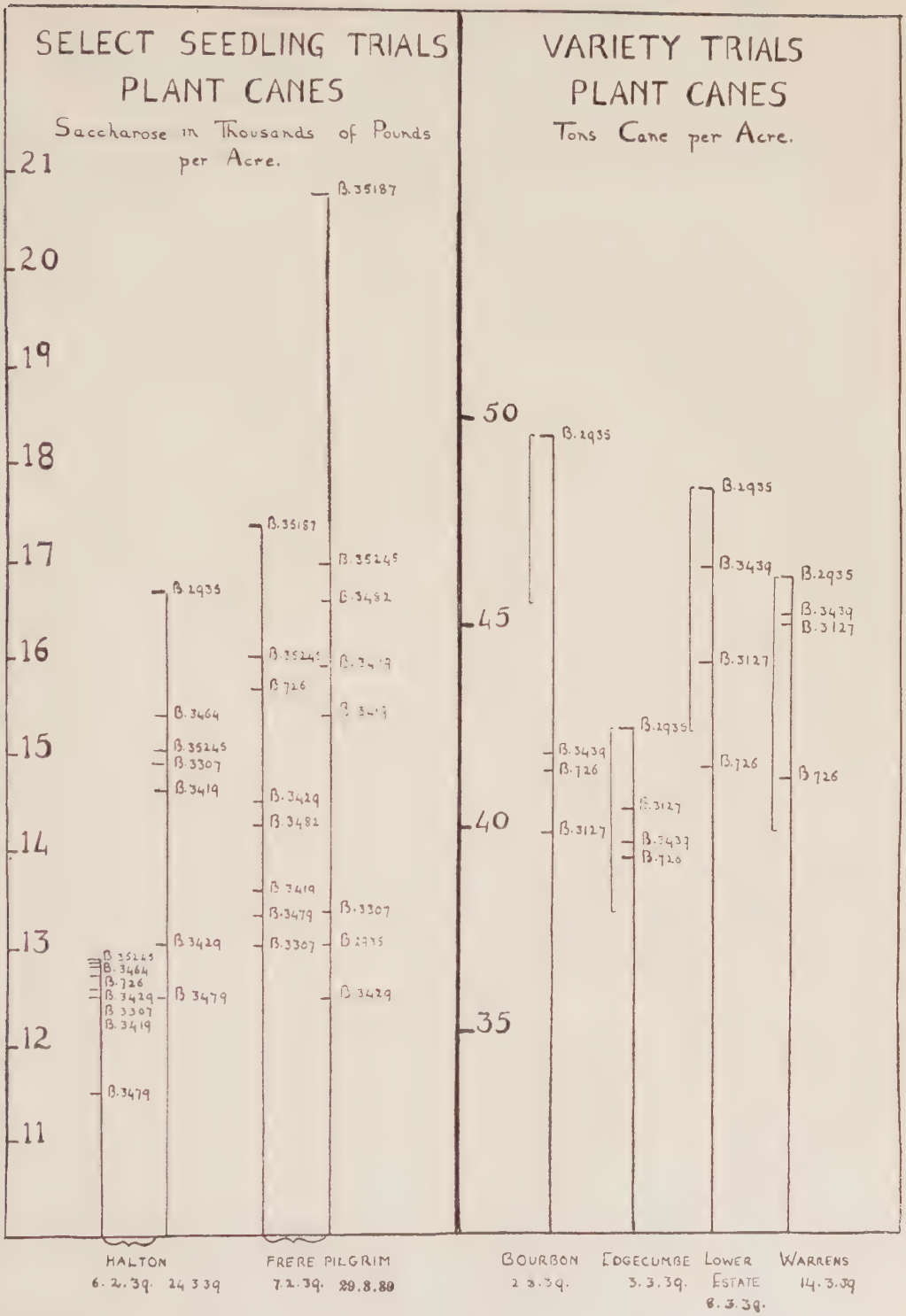


FIG II. CATEGORY B.



50. Although it is probable that B.2935 out-yielded both in sugar per acre, it would appear to be advantageous to grow a small percentage of B.726 for early reaping, at which time the juice quality of B.2935 is low and the fibre low and of poor burning quality.

51. There is little to choose between B.726 and B.3127 and it seems there would be no advantage gained by replacing the former with the latter.

52. In the plant cane Select Seedling Trials, B.2935 was the standard. It is quite clear from the diagrams on Fig. I that B.35245 is the only serious competitor of the standard in this category. The comparative average data of B.2935 and B.35245 for both stations is therefore given here:—

Variety	Early Reaping				Late Reaping			
	Yield Tons per acre	No. rotten canes per plot	Per cent. sucrose in cane	Pounds saccharose per acre	Yield Tons per acre	No. rotten canes per plot	Per cent. sucrose in cane	Pounds saccharose per acre
B.2935	42.02	15	12.28	11,572	38.88	47	14.94	13,001
B.35245	36.55	13	14.27	11,460	35.98	28	15.44	12,557

53. It is seen from the above that B.35245 gives a lower cane yield than the standard but compensates by having a very much higher juice quality, especially early in crop. Much will depend on how they compare as ratoons. B.35245 is to be tested in Variety Trials against B.2935 in Category A.

Category B. (Figure II).

54. Two plant cane Select Seedling Trials and four plant cane Variety Trials were reaped in this Category.

55. In the Variety Trials, the new seedlings—B.3127 and B.3439 were compared with the standards—B.726 and B.2935. At Bourbon, B.2935 gave an emphatically superior cane and probably sugar yield. At the other stations —Edgecumbe, Lower Estate and Warrens—B.2935 yielded only slightly better than the others and the brix figures must also be considered. These were as follows:—

Station	Brix and Variety.			
	B. 2935	B. 726	B. 3127	B. 3439
Edgecumbe	18.8	22.1	21.6	20.7
Lower Estate	19.3	21.2	20.5	22.1
Warrens	20.2	22.4	22.5	22.1
Averages	19.4	21.9	21.5	21.6

56. From these figures coupled with the cane tonnages, it would appear that, in estimated sugar yield, there was little to choose at Edgecumbe between B.3127 and B.726, both of which probably outyielded B.3439, while all three probably outyielded B.2935. At Lower Estate it is probable that B.3439 out-

yielded the others which possibly yielded about the same amount of sugar. At Warrens, it is certain that B.3127 and B.3439 outyielded both B 726 and B.2935 which were probably about equal. It would appear that, under good rainfall conditions in the intermediate rainfall areas of St. Michael, St. George and St. Philip, B.726, B.3127 and B.3439 give as good or even better sugar yields than B.2935. In lower rainfall years, however, it is probable that this would apply to B.3439 only. Both B.3127 and B.3439 tended to give higher cane yields than B.726. Much, however, will depend on ratoon yields and these will be awaited with interest.

57. In the plant cane Select Seedling Trials at Halton and Frere Pilgrim the standards were B.726 in the early and B.2935 in the late reaped trials respectively. Of the seedlings reaped at *both* stations, as in Category A, B.35245 was the most promising. B.3307, B.3419, B.3429, B.3479 were all, for one reason or another, inferior to the standards. B.3464 was reaped at Halton only. It gave here very high cane tonnages, but was very susceptible to cane rot and had very low juice quality. It is not up to commercial standard. B.3482 was grown at Frere Pilgrim only, but here was markedly inferior to the standards. B.35187 was also only grown at Frere Pilgrim in this category. Here, it gave, for this area, exceptionally high cane yields—approximately 57 tons per acre. It was, however, late in ripening. At the late reaping, when it was nearer full ripeness, it gave a calculated yield of approximately 21,000 pounds of saccharose per acre—the highest figure ever reached in comparable Departmental trials. This seedling appears to be peculiarly suited to conditions as exemplified at Frere Pilgrim and also to red soils (q.v. below).

58. To conclude this category, it may be noted that B.3127, B.3439, B.35187 and B.35245 are all promising and will be further tested.

Category C (*Fig. III*).

59. In this category one each of plant cane and first ratoon Select Seedling Trials and plant cane and first ratoon Variety Trials were reaped.

60. In the plant cane Variety Trial, B.3127 at both stations was definitely superior to the standard in cane yield while the brix figures were B.726—22.5 and B.3127—22.0. In the first ratoon Variety Trial, B.3127 again outyielded B.726. B.3127 is therefore promising for valley soils. B.3439 gave only slightly better plant cane yields and was not cut as a ratoon. Nothing definite, therefore, can be stated about its value in valley soils.

61. From the ratoon Variety Trial and Select Seedling Trial, it can be seen that the yields of B.3013 are very inconsistent. From trials carried out in this category up to date, it would appear definite that B.3013 is *not* suited to valley soils. The seedlings B.3267 and B.3327, while giving good cane yields were appreciably inferior to the standard—B.726 in juice quality and soundness and will be discarded. B.3307 was markedly inferior and will be discarded.

62. In the plant cane Select Seedling Trial at Hampton, B.726 was standard. The seedlings, B.3307, B.3479, and B.3482 were decidedly inferior to it. B.3419 improved during crop to equal B.726 at the late reaping. B.3429 gave good cane and sugar yields but its canes are known to rot very readily and, for this reason, it will be discarded. B.35245 once again is promising. Before any definite pronouncement can be made, however, it will be necessary to get ratoon yields.

Category D. (*Figs. IV & V*).

63. Three plant cane, three first ratoon Select Seedling Trials and four plant cane, five first, four second and one third ratoon Variety Trials were reaped in this category.

64. The second and third ratoon Variety Trials represented a completion of the trials to test B.3013 against the standards—B.726 and B.H.10(12) in red soils. For this reason the results over all crops are given in Table VIII. Brix figures were obtained for the 1939 reapings only, during which year the Zeiss Hand Refractometer was used for the first time in Variety Trials.

FIG III. CATEGORY C.

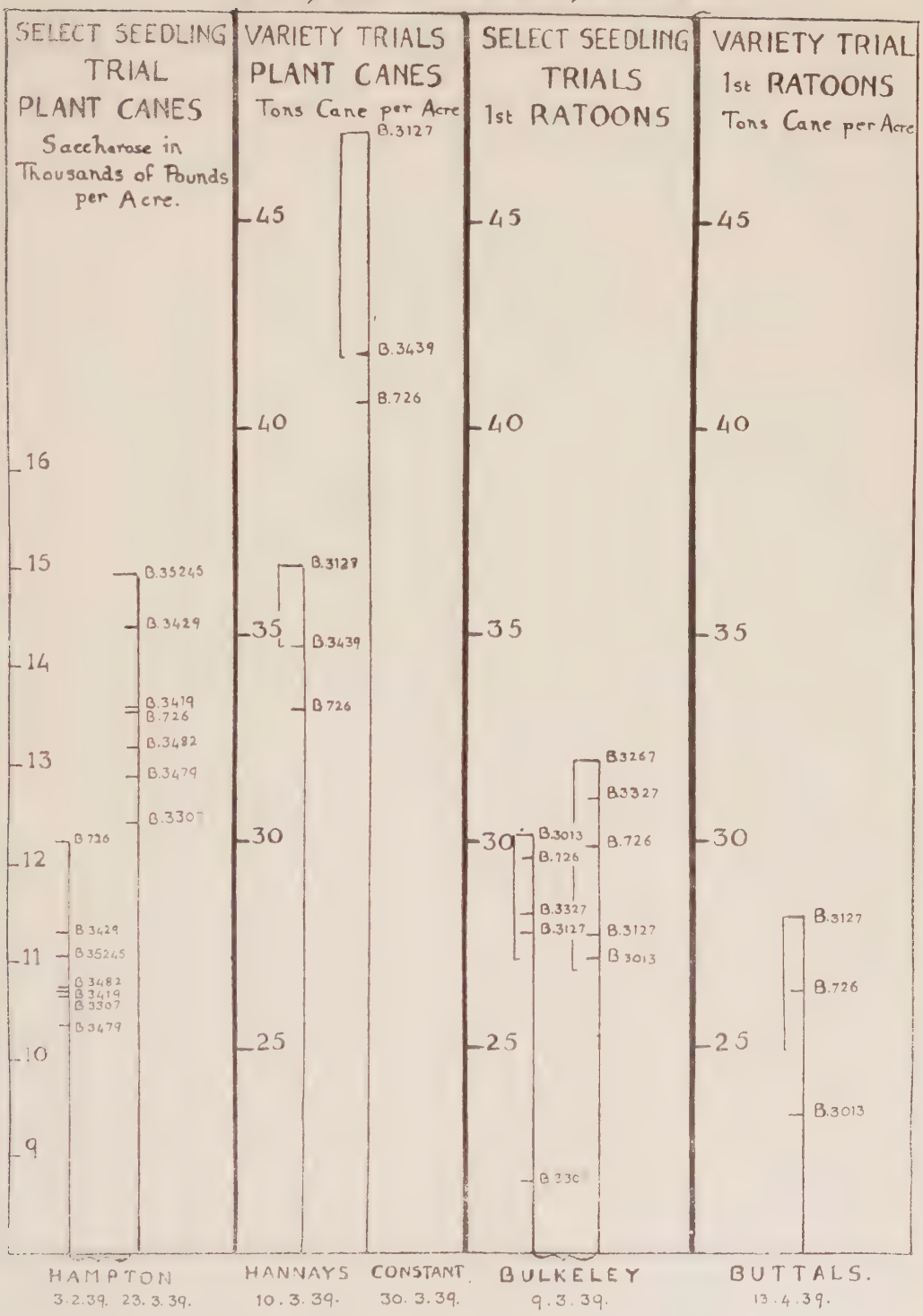


FIG IV. CATEGORY D.

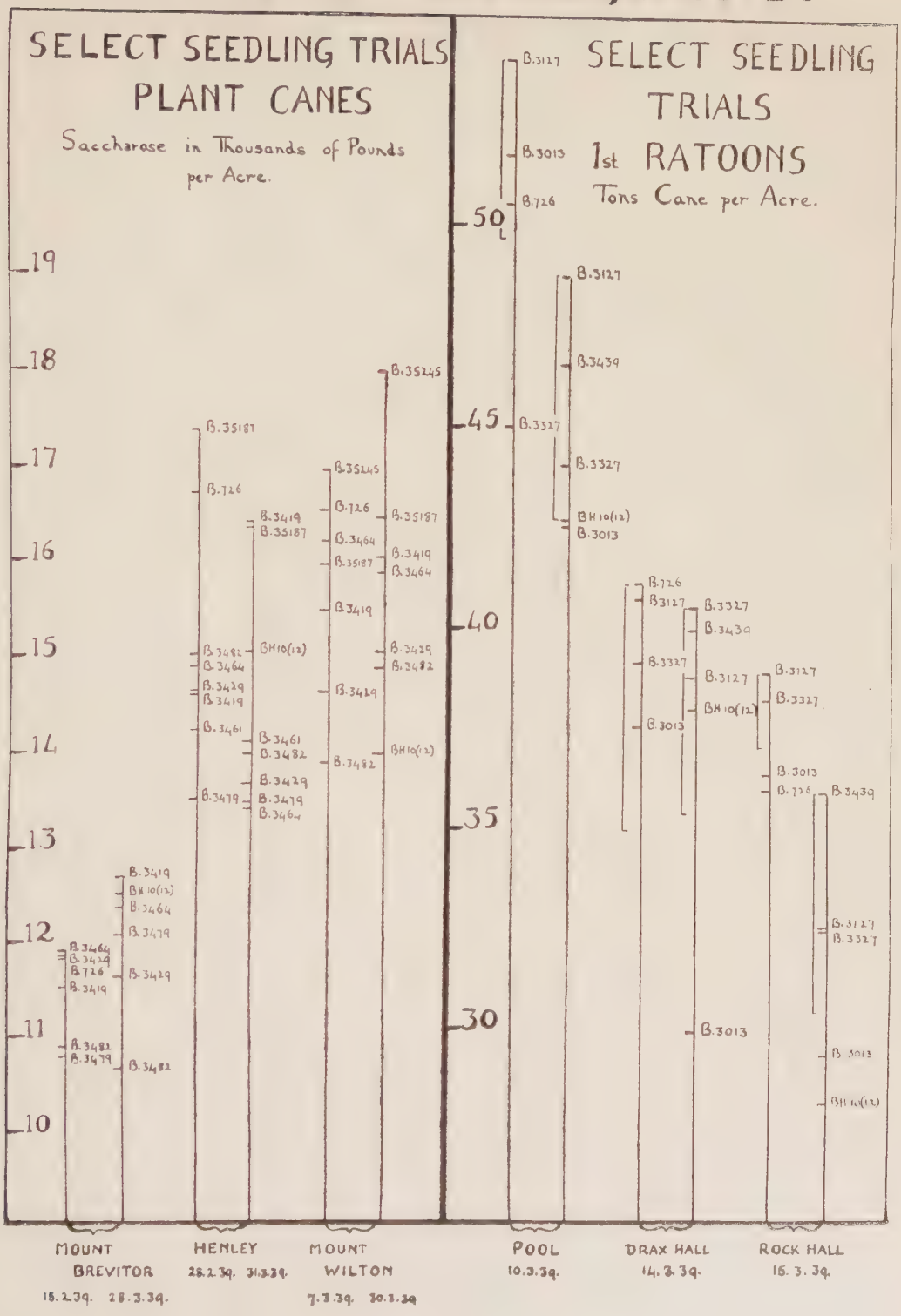
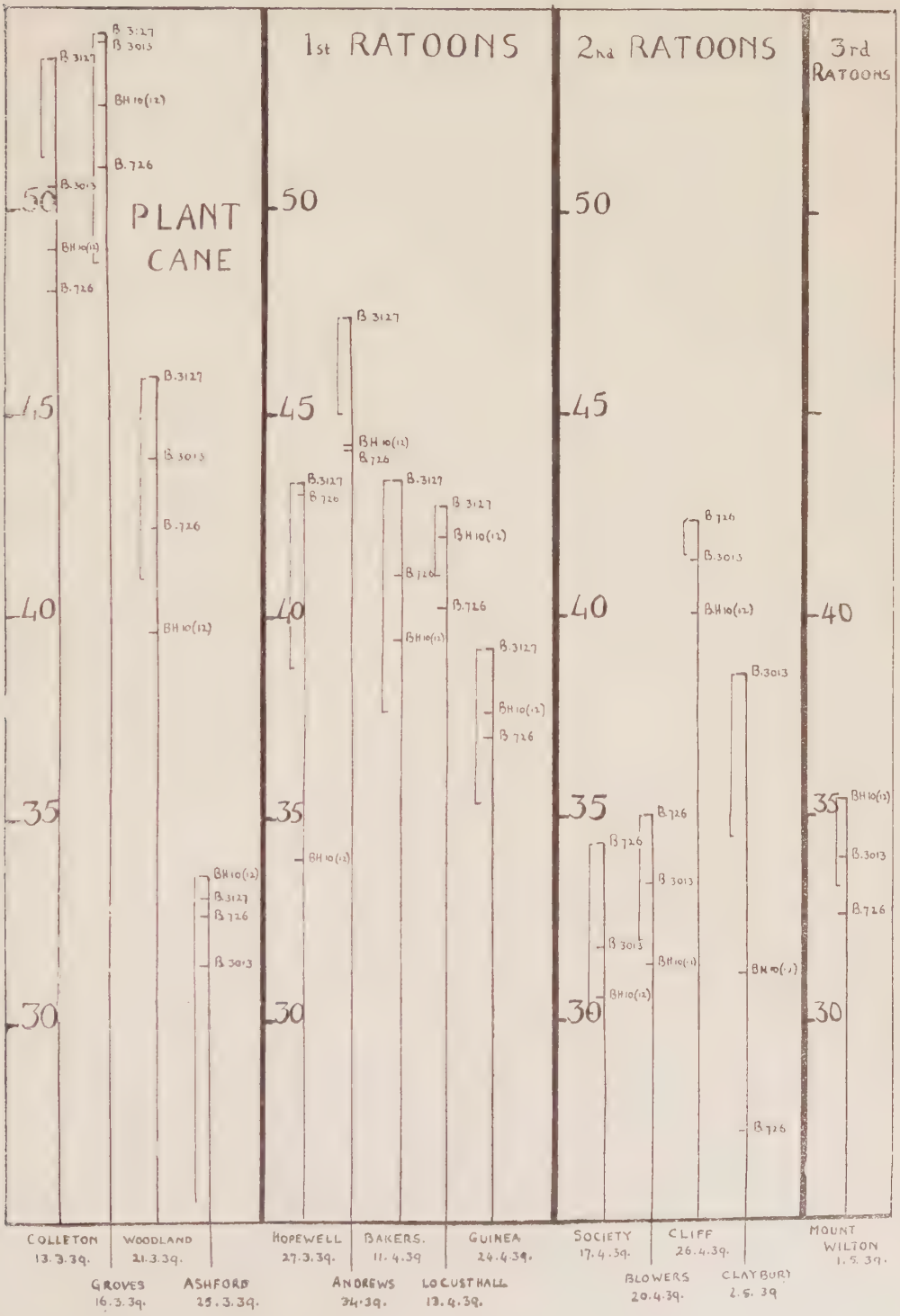


FIG V. CATEGORY D (concld).

VARIETY TRIALS. TONS CANE PER ACRE.



SUGAR BOOM

TABLE VIII.

B.3013 Versus the Standards—B.726 and B.H.10(12) in Red Soil Areas—Category D.

Detailed Cane Yields for all Crops and Brix Figures for the 1939 Crop.

Station.	Variety and Yield in Tons per Acre.															Brix—1939.		
	B. 726					B. H. 10(12)					B. 3013					B.726	B. H. 10 (12)	B.3013
	Pl.	1st R.	2nd R.	3rd R.	Total.	Pl.	1st R.	2nd R.	3rd R.	Total.	Pl.	1st R.	2nd R.	3rd R.	Total.			
Society ...	38.38	27.92	34.44	—	100.74	38.55	28.24	30.51	—	97.30	35.82	26.85	31.74	—	94.41	23.7	23.5	24.2
Blowers ...	39.20	35.38	35.06	—	109.64	43.16	34.64	31.42	—	109.22	45.19	34.21	33.47	—	113.47	23.6	23.6	23.7
Cliff ...	43.60	38.98	42.15	—	124.73	44.49	41.52	40.07	—	126.08	50.12	41.15	41.50	...	132.77	23.9	23.5	23.5
Claybury ...	41.92	34.32	27.14	—	103.38	41.93	35.93	31.29	—	109.15	50.05	39.70	38.62	...	128.37	24.5	23.6	24.4
Mt. Wilton ...	36.88	43.17	30.46	32.58	143.09	38.04	39.09	37.15	35.35	149.63	40.46	44.15	38.91	34.03	157.55	23.1	21.5	23.2
Averages ...	40.00	35.95	33.85	32.58	116.32	41.23	35.89	34.09	35.35	118.28	44.33	37.33	36.85	34.03	125.31	23.8	23.1	23.8

65. From the above Table VIII, it can be seen that, for all estates over all reapings, B.3013 has given greater cane yields than the standards. This greater yield is sustained through plant canes, first and second ratoons. It has to be noted, however, that the relative yields of B.3013 and standards vary according to the estate. Thus, at Society, B.3013 was inferior, at Blowers, Cliff and Mt. Wilton, superior, and at Claybury, markedly superior to the standards. Experiments conducted by the Department would indicate with regard to juice features, that B.726 ripens earliest, B.3013 next and B.H.10(12) last of all and that when all are ripe their juice qualities are about equal. From all relevant tests, it would appear that B.3013 is superior to both B.726 and B.H.10(12) in the best class red soils, i.e., the highest yielding red soils.

66. The first ratoon Variety Trials were a continuation of five plant cane trials designed to test B.3127 against the standards—B.726 and B.H.10(12). It may be noted here that in the plant canes all three varieties tested gave approximately similar cane yields. From Fig. V, however, it can be seen that in the first ratoons B.3127 tends to give higher yields than the standards. This tendency is further emphasised in the results of the first ratoon Select Seedling Trials (Fig. IV).

67. In the plant cane Variety Trial B.3127 was tested against B.726, B.H.10(12) and B.3013: the last named being regarded now as a standard. (See Fig. V.) Here again, with the exception of a low yielding trial at Ashford, B.3127 outyielded B.726 and B.H.10(12) and to a lesser extent B.3013.

68. With regard to juice quality, the data so far accumulated indicate that B.3127 equals B.H.10(12) both in rate of ripening and actual sucrose in juice. It is therefore apparent that B.3127 has distinct promise for red soil areas.

69. In the first ratoon Select Seedling Trials (Fig. IV), B.3327 gave reasonably good yields but it is not expected to come up to commercial standard. B.3439, which was in the group reaped late as plant canes, gave in ratoons very good yields, more especially at Rock Hall. The field here used was typical of certain areas in the red soils, i.e. rocky and exposed. In such conditions, B.3439, appears to perform much better than the standards and could safely be grown on a commercial scale.

70. In the plant cane Select Seedling Trials, the standards were B.726 in early and B.H.10(12) in late reaped groups. Of the seedlings tested, the following are considered inferior to the standards:—B.3429, B.3461, B.3464, B.3479, B.3482. The seedling B.3429 gives reasonably good cane yields but is extremely susceptible to rotting. B.3464 gives very high cane yields but very low juice qualities and tends to rot. B.3479 yields well but has poor juice quality. B.3461 and B.3482 are both mediocre.

71. The promising seedlings are—B.3419, B.35187 and B.35245. B.3419 appears to best advantage in the late reaping where it emphatically outyielded the standard—B.H.10(12) in cane and calculated sugar yields in two out of three trials. It would, however, appear to be inferior to B.726 in early reapings. B.35187 was tested at two stations—Henley and Mt. Wilton. Here it gave exceedingly high cane yields. Its sugar yields, however, were not so outstanding: this on account of its being a late ripener. Even at the late reapings it was far from mature. It is almost certain that if cut when ripe, it would far outyield the standards in sugar yields. This seedling is interesting in that it possesses some wild cane blood. So far, in tests in Barbados, it has proved resistant to mosaic disease. One surprising feature in view of its genealogy is that it does not arrow, even in red soils. The noble-canes grown as standards all arrow in red soils. B.35187 has been distributed to small holders in mosaic-

proclaimed red-soil areas and is giving excellent results. The seedling B.35245 was tried at one station only—Mt. Wilton. Here it was first in calculated sugar yields at both early and late reapings. This seedling has more wild-cane blood than B.35187. It is, however, susceptible to mosaic and shows the maximum allowable leaf symptoms of gumming disease. The individual canes are long and thick, the cane yields are high and the juice quality excellent early in crop.

72. The ratoon performances of both these B.35' seedlings will be awaited with great interest.

73. All three promising seedlings have been or will be put in co-operative variety trials. The other B.34' seedlings will be discarded.

III. SPECIAL INVESTIGATIONS IN SUGAR CANE.

Introduction.

74. The greatly increased number of seedling trials placed an unusually heavy demand on the staff during the crop season. It was therefore impossible for the Assistant Botanist during this period to initiate investigations into seedling cane rotting and ratooning.

75. Out of crop more time is available, and during this period routine periodic observations are made in the gumming disease—and mosaic disease—resistance test plots, growth measurements carried out and analyses of the previous crop results made. The last named is very important, in view of the direct application of the findings from the analyses to the breeding work.

76. The Zeiss Hand Refractometer studies, in so far as they have a bearing on seedling selection, have been completed.

77. In view of the very promising seedlings appearing more recently from nobilisation work it is felt that all energies should be focussed on its expansion together with special investigations which have an immediate bearing on seedling testing and selection, such as the gumming and mosaic disease resistance testing and growth measurements.

78. It has therefore been decided to discontinue the seedling cane rotting and ratooning studies in order to allow for the expansion of the actual breeding and selection work.

Growth Measurements.

79. During the season 1937-39, growth measurements were made in the following newer seedlings included in the plant cane Maturity Experiments: B.3419, B.3464, B.3479, B.35187, B.35245. The standard varieties B.H.10(12) (high rainfall district) B.726 (high and low rainfall district) and B.2935 (low rainfall district) were included and measured for purposes of growth comparisons.

80. Growth measurements were also carried out on the following seedlings and standard varieties in the first ratoon Maturity Experiment in the high rainfall district:—B.H.10(12), B.726, B.3013, B.3127, B.3439.

Gumming Disease Investigations.

81. During the season under review a total of 173 seedlings were tested at Dodds for their resistance to gumming disease. Of these 112 were noble-canes planted in twenty-four stool plots, and the remainder nobilisations planted in three stool plots. A summary of the results is given below:—

	No gumming	Trace	Very slight	+	++	+++	++++	Total
Noble canes	39	16	12	19	12	12	2	112
Nobilisations	50	4	1	2	2	2	0	61

Mosaic Disease Resistance Tests.

82. Up to the present, a total of 12 seedlings have been under test for mosaic disease resistance for a period of fifteen months and over without showing any symptoms of the disease, while 11 seedlings have been eliminated owing to their susceptibility.

83. Of the remaining 94 seedlings now included in the test, 2 have been in for a period of nine months and 8 for a period of three months, leaving 84 seedlings which were planted in March and April of this year, when it was decided to extend the test in the hope that in time it would be possible to have included in the test all nobilised seedlings selected from the First Year Seedling Trial.

84. The last planted group of seedlings consists of 18 seedlings of the B.37′ series, which completes the number of this series to be tested, and 66 seedlings of the B.38′ series, leaving another 9 seedlings of this series still to be included in the test.

85. The accompanying table shows the reaction to mosaic disease of some of the Barbados seedlings tested in Jamaica and Uganda as compared with their reaction in Barbados.

86. Although the results shown are by no means final, it can clearly be seen that the apparent resistance of a seedling to mosaic disease in Barbados does not necessarily mean that it will be resistant in Jamaica or elsewhere.

87. Again it must be stressed that resistance tests such as those now in progress in Jamaica and in Uganda, apart from being necessary so as to determine the reaction of seedlings to mosaic in the countries concerned, are invaluable guides to the Station's breeding programme.

Table Showing the Reaction to Mosaic Disease of certain Seedlings Tested in Barbados, Jamaica and Uganda.

Seedling	Derivation	Reaction to Mosaic		
		Barbados	Jamaica	Uganda
B.3254	4th glagah (P.O.J.2725)	Apparent resistance	Apparent resistance	Not tested
B.3215	„ „ „	„ „	Infected	„ „
B.3172	„ „ „	„ „	Apparent resistance	„ „
B.34134	„ „ (P.O.J.2364)	Infected	Infected	„ „
B.34105	„ „ „	„	Apparent resistance	„ „
B.34110	„ „ „	Apparent resistance	„ „	„ „
B.34117	P.O.J.2725 x Co.281	„ „	„ „	„ „
B.35200	Toledo x S.C.12/4	„ „	Infected	„ „
B.3337	3rd glagah (P.O.J.2364)	„ „	„	„ „
B.35204	Toledo x S.C.12/4	„ „	„	„ „
B.34104	Co.281 x B.H.10(12)	„ „	„	„ „
B.34106	4th glagah (P.O.J.2364)	„ „	„	„ „
B.34130	„ „ „	Infected	„	„ „
B.35187	5th glagah (P.O.J.2725)	Apparent resistance	„	Apparent resistance
B.34129	4th glagah (P.O.J.2364)	Infected	„	„ „
B.34137	P.O.J.2878 x B.H.10(12)	Apparent resistance	„	„ „
B.35176	4th glagah (P.O.J.2364)	Infected	„	Infected
B.35237	„ „ „	„	„	Apparent resistance
B.34123	„ „ „	Apparent resistance	Not tested	„ „
B.35151	„ „ „	Doubtful infection	„ „	„ „
B.35179	„ „ „	Apparent resistance	„ „	„ „
B.35245	Ba.11569 x P.O.J.234	Infected	„ „	„ „
B.35221	„ x Co.290	„	„ „	Infected

Investigations with the Zeiss Hand Refractometer as an Indicator of Ripening.

88. During 1935 and 1937 investigations were carried out on the use of the Zeiss Hand Refractometer as an indicator of ripening. Working on the hypothesis that ripeness is attained when the top/bottom refractometer solids ratio reaches unity, a study was made of the effects of season, place, cane age class, and variety on ripening. These results have been published.

89. In order to ascertain how far the top/bottom ratio hypothesis might be relied on, a further investigation was undertaken and data was obtained at the reaping of the Maturity Experiments at the low and high rainfall stations in 1938. A summary of the results is given below:—

90. Using the same sampling technique as has been previously described,* top/bottom refractometer solids ratios were calculated for each seedling, at each place and for each time of reaping. These ratios were in each case the quotient of the mean of the top readings divided by the averages of the middles and bottoms. In addition sample bundles from each plot were sent to the laboratory, where they were divided into tops, middles and bottoms respectively and determinations of per cent. sucrose, per cent. glucose and degree brix made. The results and conclusions are summarised here:—

1. *Zeiss Hand Refractometer Solids*: In every seedling and at both stations the refractometer solids increased steadily from the early reaping until the late reaping and as might be expected the increase was most marked in the top sections of the cane.
2. *Degree Brix*: This agreed closely with the hand refractometer determinations although in every case they were somewhat lower, the difference being more marked in the top sections than in the middle and bottom sections.
3. *Per Cent. Sucrose*: As in 1 and 2 the per cent. sucrose increased steadily from the early until the late reaping in every case—the increase being most marked in the top sections of the cane.
4. *Per Cent Glucose*: There was little variation in the per cent glucose between the early and late reapings.
5. *Sucrose/Glucose Ratio*: At the low rainfall station there was little similarity between the four varieties, while at the high rainfall station there was a sharp rise in the sucrose/glucose ratio at the middle reaping followed by a sharp drop at the late reaping; this was the same for each of the four varieties.
6. *Top/Bottom Refractometer Solids Ratio*: At the low rainfall station the top/bottom refractometer solids ratio reached unity at the middle reaping in three out of the four varieties, while the fourth reached unity at the late reaping. At the high rainfall station one seedling reached unity by the middle reaping and one at the late reaping, the other two seedlings failed to reach unity even at the late reaping.
7. At both stations, the weight of the cane reaped tended, if anything, to rise or at worst to remain approximately the same over the three reapings. It is therefore extremely probable that the highest potential sugar yields were obtainable at the last reaping.
8. It seems reasonable to regard any variety at any one place as being at its peak of maturity during crop at the time when it is giving its highest sugar yields. In these tests this was at the late reaping.

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* McIntosh, A. E. S. and Stevenson, G. C.—Studies in the Use of the Zeiss Hand Refractometer (3). The Zeiss Hand Refractometer as an Indicator of Ripening in Sugar Cane. B.W.I. Central Sugar Cane Breeding Station Bull., No. 18, June, 1938.

9. It would thus appear that, from the commercial view point, criteria such as sucrose/glucose ratio and hand refractometer top/bottom solids ratio would actually be misleading.
10. Since in all hand refractometer investigations carried out in recent years in Barbados, it has been conclusively shown that under Barbados conditions, there is a strong positive correlation between hand refractometer solids and sucrose per cent. in juice, and that the latter tends to improve throughout the course of the crop, the determination of hand refractometer solids coupled with cane weights of seedlings throughout crop is the most reliable means of assessing the comparative maturation rates of seedlings.
11. Maturity experiments as conducted over the last ten years would appear to be the most satisfactory method of doing this.

IV. MISCELLANEOUS.

Advice to Contributing Colonies *re* Allocation of New Seedlings for Testing.

91. This was effected by two methods, i.e. (1), in the form of memoranda by the Geneticist sent to the Plant Quarantine Station and in turn sent out by the latter to Colonies when batches of quarantined seedlings were liberated and/or (2) memoranda by the Geneticist direct to Departments of Agriculture or to individual growers.

92. With regard to the former, a routine has been adopted such that, when the Central Sugar Cane Breeding Station is informed by the Plant Quarantine Station that certain seedlings are fully quarantined and ready for despatch, the Central Sugar Cane Breeding Station advises the Plant Quarantine Station where to send them and at the same time forwards to the Plant Quarantine Station a memorandum on the seedlings in question. This memorandum gives the parentages of the seedlings and suggests a testing procedure for each. A copy of this memorandum is despatched by the Plant Quarantine Station with the seedlings.

93. In some cases, it is felt that this memorandum should be more detailed for some seedlings for certain places, in which case a fuller memorandum is written and submitted direct to the Departments of Agriculture of the Colonies concerned.

94. Advice on the above lines was sent throughout the year.

Despatch of Seedlings to the Plant Quarantine Station.

95. During the period under review two batches of seedlings were sent to the Plant Quarantine Station, i.e.—

(1) on 21st September 1938—Seven noble-cane seedlings.

(2) on 14th March 1939—Sixteen nobilised seedlings.

These consignments were accompanied by memoranda giving the pedigrees and likely eventual allocation of each seedling.

Despatch of Sugar Cane Fuzz to the Plant Quarantine Station.

96. In connection with the investigations into variety resistance to froghopper in Trinidad fuzz samples derived from thirteen crosses representing a wide range in derivation were sent to the Plant Quarantine Station for growing and forwarding to the appropriate destination.

Visits.

97. The Geneticist visited Jamaica in September/October 1938 and represented the Station at the International Society of Sugar Cane Technologists' meeting in Louisiana in October/November 1938. The Jamaica visit is reported in detail in Bulletin No. 19 of the Station. A report on the visit to Louisiana is included as Appendix III to this report.

Extension of Nobilisation Scheme by Importation of further wild cane material.

98. As noted elsewhere the success of the existing nobilisation work is practically assured. So much so, that it would seem that nobilisation work alone

will be done in the near future and noble-cane breeding (using noble-cane parents only in any cross) discontinued.

99. To date, the evidence shows that by nobilising wild species and varieties or their early nobilised derivatives, the range of variability in field and factory characteristics in the progenies has greatly expanded to include individual seedlings with extremes beyond those already experienced in purely noble-cane work. In addition, desirable characteristics such as resistance to mosaic and gumming diseases, strong ratooning power and hardiness under adverse conditions have been obtained.

100. So far, in nobilisation work, breeding has proceeded along the following main lines: nobilisation of:—

(1) *Saccharum spontaneum* Java form (''glagah'').
(2) ,, ,, Indian form.
(3) ,, ,, Celebes form (''toledo'')
(4) ,, *barberi* ''Chunnee''
(5) ,, *sinense* ''Uba''

101. In all these cases, it has taken some time to eliminate the undesirable short-season habit in nobilised derivatives. This is now being attained and many promising commercial seedlings are being obtained.

102. It is felt that the above lines of work are well in hand, so much so as to allow of a possible expansion of the range of initial wild cane breeding material.

103. The address by Dr. Brandes at the International Society of Sugar Cane Technologists' meeting at Baton Rouge indicated clearly the breeding potentialities for British West Indian conditions of a selection of wild types more recently obtained by the U.S.A. Government.

104. Since the Baton Rouge meeting, correspondence has taken place between the Station and Dr. Brandes and a critical selection of wild types will finally be asked for.

105. These types would not be available to the Central Sugar Cane Breeding Station for one to three years yet—depending on their period of quarantine in Trinidad—by which time the existing nobilisation work would be established on a routine basis. This would clear the way for initial experimental work on the new material.

V. PUBLICATIONS ISSUED.

A. Bulletins, Papers, Articles etc. issued during the period under review.

(i) BULLETINS.

(1) McIntosh, A. E. S. & Stevenson, G.C.—Studies in the Use of the Zeiss Hand Refractometer. (3) The Zeiss Hand Refractometer as an Indicator of Ripening in Sugar Cane, B.W.I., Cent. S. C. B. Sta. Bull. No. 19. June, 1938.
(2) McIntosh, A. E. S.—Report on a Second Visit to Jamaica, October, 1938. Ibid Bull. No. 19, Nov. 1938.
(3) The Yield of Sugar Cane in Barbados. Ibid. Bull. No. 20. Jan. 1939.

(ii) PAPERS.

106. Two papers by the Assistant Botanist, Mr. G. C. Stevenson on studies in (1) gumming disease inheritance and (2) mosaic disease resistance testing were presented by the Geneticist at the Louisiana Conference.

(iii) ARTICLES.

107. Three articles on cane breeding by the Station for Jamaica were written by the Geneticist while in Jamaica. These were written for:—
(1) the Jamaica Department of Science and Agriculutre;
(2) the Jamaica Sugar Manufacturers' Association; and
(3) the Jamaican Association of Sugar Technologists.

108. The article written for the last named was published in Vol. II No. 2 of the Quarterly, the publication of the Association.

B. Annual Reports and Bulletins Issued to Date By the Station.

(a) ANNUAL REPORTS.

(1) Report for the Period ending September 30, 1934..
(2) Report for the Year ending September 30, 1935.
(3) Third Annual Report ending September 30, 1936.
(4) Fourth Annual Report ending September 30, 1937.
(5) Fifth Annual Report ending September 30, 1938.

(b) BULLETINS.

(6) Bulletin 1—Report on the Sugar Cane Breeding Problems of Antigua, Trinidad and St. Kitts—A. E. S. McIntosh, September, 1933.
(7) Bulletin 2—Report on the Sugar Cane Variety Problems in St. Lucia—A. E. S. McIntosh, June, 1934.
(8) Bulletin 3—Report on a Visit to Jamaica—A. E. S. McIntosh, Sept., 1934.
(9) Bulletin 4—Report on a Visit to Grenada—A. E. S. McIntosh, November, 1934.
(10) Bulletin 5—Investigations into the Root Development of the Sugar Cane in Barbados (1) Root Development in Several Varieties under one Environment—G. C. Stevenson and A. E. S. McIntosh, February, 1935.

(11) Bulletin 6—An Account of the Policy and Methods employed in the Breeding and Initial Stage of Selecting Sugar Cane Seedlings—A. E. S. McIntosh, June, 1935.

(12) Bulletin 7—Report on a Second Visit to Antigua—A. E. S. McIntosh, July, 1935.

(13) Bulletin 8—Gumming Disease Investigations in Barbados—A. E. S. McIntosh and G. C. Stevenson, August, 1935.

(14) Bulletin 9—An Account of the Methods employed in Testing and Selecting Sugar Cane Seedlings for Thick-Cane Areas in the British West Indies—A. E. S. McIntosh.

An Account of the Methods Employed in Carrying out Sugar Cane Seedlings and Variety Trials in Barbados—A. E. S. McIntosh and C. B. Foster, Sept., 1935.

(15) Bulletin 10—The Yield of Sugar Cane in Barbados in 1936—August, 1936.

(16) Bulletin 11—Investigations into the Root Development of the Sugar Cane in Barbados (2) Further Observations on Root Development in Several Varieties under one Environment—G. C. Stevenson, August, 1936.

(17) Bulletin 12—Sugar Cane Fuzz Storage Experiments—A. E. S. McIntosh, April, 1937.

(18) Bulletin 13—Report on a Second Visit to Grenada, April, 1937—A. E. S. McIntosh, June, 1937.

(19) Bulletin 14—A Botanical and Agricultural Description of Recently Produced Commercial Seedlings—A. E. S. McIntosh, June, 1937.

(20) Bulletin 15—Report on a Visit to St. Kitts and Antigua, June, 1937—A. E. S. McIntosh, July, 1937.

(21) Bulletin 16—(1) Studies on Gumming Disease of Sugar Cane. (2) Investigations into the use of the Zeiss Hand Refractometer—G. C. Stevenson—July, 1937.

(22) Bulletin 17—The Yield of Sugar Cane in Barbados in 1937—August, 1937.

(23) Bulletin 18—Studies in the use of the Zeiss Hand Refractometer (3) The Zeiss Hand Refractometer as an Indicator of Ripening in Sugar cane—A. E. S. McIntosh and G. C. Stevenson, June, 1938.

(24) Bulletin 19—Report on a Second Visit to Jamaica October, 1938—A. E. S. McIntosh, November, 1938.

(25) Bulletin 20—The Yield of Sugar Cane in Barbados in 1938—January, 1939.

VI. STATEMENT OF EXPENDITURE FOR 1938-39.

		£	s.	d.
1.	Personal Emoluments	898	7	4
2.	Personal Allowance to Geneticist	100	0	0
3.	Clerical Assistance	50	0	0
4.	Provident Fund	20	0	0
5.	Seedling Trials	445	16	5
6.	Stationery and Publications	34	7	9
7.	Travelling	331	18	0
8.	Visit of Geneticist to Jamaica and Louisiana	161	3	9
9.	Contingencies	9	1	9
10.	Capital Expenditure	130	4	2
	Total	2,180	19	2

APPENDIX I.

SUGAR CANE BREEDING, SEEDLING RAISING AND FIELD NURSERY PLANTING, 1938—39. B.41′ SERIES.

Details of Crosses Made, their Germinations, Numbers Potted and Numbers Planted in Field Nursery.

Cross.	Group.	No. Germinations. Nov. 1938-Jan. 1939.	No. Potted. Jan.–Feby 1939.	No. Planted in field Nursery.
	Noble.			
Ba.11569 x B.H.10(12)	*S. officinarum*	3,689	2,816	1,871
,, x B.6450	,,	260	189	129
,, x B.603	,,	952	630	416
,, x Ba.8069	,,	2,166	1,030	789
,, x Ba.6032	,,	1,083	820	500
,, x B.693	,,	1,015	1,020	650
,, x B.417	,,	12	0	0
,, x Q.813	,,	495	450	324
,, x D.49/30	,,	714	464	290
,, x D.66/30	,,	4,609	561	301
B.3439 x B.3489	,,	238	190	100
,, x E.K.28	,,	1,027	510	420
,, x B.3127	,,	28	0	0
,, x Ba.6032	,,	187	185	150
,, x B.3461	,,	325	245	160
,, x B.3307	,,	1,099	674	356
,, x B.417	,,	181	68	60
B.3138 x Ba.6032	,,	17	0	0
		18,097	9,852	6,516

APPENDIX I.—(*Continued*).

Cross.	Group.	No. Germinations. Nov. 1938-Jan. 1939.	No. Potted. Jan.–Feby 1939.	No. Planted in field Nursery.
	Nobilisations.			
	S. spontaneum–Java. (a) 3rd degree			
B.37276 x B.6450	,,	5	0	0
B.37275 x B.2935	,,	16	13	10
B.37278 x B.2935	,,	75	67	60
B.37266 x Ba.6032	,,	109	77	60
B.35261 x B.2935	,,	31	18	10
B.3254 x P.O.J.2878 ...	,,	0	0	0
B.3215 x P.O.J.2878	,,	1,262	1,018	880
B.35257 x B.2935	,,	285	160	100
		1,783	1,353	1,120
P.O.J.2725 x B.3464	(b) 4th degree	567	460	352
B(30)L.6 x B.3419	,,	476	452	401
B.3382 x B.H.10(12)	,,	19	0	0
P.O.J.2722 x B.2935	,,	177	122	100
P.O.J.2725 x B.2935	,,	204	180	140
B.3013 x P.O.J.2878	,,	663	520	470
M.D.47 x B.H.10(12)	,,	47	46	0
B.3354 x B.H.10(12)	,,	77	74	60
B.3353 x B.H.10(12)	,,	75	61	49
B.3353 x Ba.6032	,,	109	70	60
B.3439 x B(30)L.7	,,	10,380	1,000	500
		12,794	2,985	2,132

APPENDIX I.—(*Continued*).

Cross.	Group.	No. Germinations. Nov. 1938-Jan. 1939.	No. Potted. Jan.–Feby 1939.	No. Planted in field Nursery.
	(c) 5th degree			
Ba.11569 x M.42	„	33	26	18
Ba.11569 x B.35237	„	176	0	0
B.34123 x B.2935	„	245	186	150
Ba.11569 x B.35176	„	163	0	0
B.3254 x B.2935	„	0	0	0
B.34102 x Ba.6032	„	116	85	60
Ba.11569 x M.28	„	21	0	0
B.34106 x B.2935	„	8	0	0
B.34102 x B.2935	„	793	584	370
B.3013 x B.34110	„	3	0	0
B.3172 x Ba.6032	„	180	116	90
Ba.11569 x B.34161	„	392	220	180
		2,130	1,217	868
	S. spontaneum–India.			
	(a) 2nd degree			
B.3013 x B.37253	„	684	565	520
B.3439 x B.37252	„	115	97	80
B.3439 x B.37256	„	746	530	480
		1,545	1,192	1,080

APPENDIX I.—*(Continued).*

Cross.		Group.	No. Germinations Nov. 1938-Jan. 1939.	No. Potted. Jan.-Feby. 1939.	No. Planted in field Nursery.
		S. spontaneum–Celebes.			
		(a) 3rd degree			
B.35197	x B.6450	,,	27	18	18
Ba.11569	x B.35256	,,	3	0	0
B.37260	x B.2935	,,	343	243	190
B.35204	x Ba.6032	,,	284	198	149
B.37257	x B.2935	,,	52	44	89
B.37258	x Ba.6032	,,	5	0	0
			714	503	446
		S. barberi			
C.P.807	x B.H.(10)12	(a) 2nd degree	62	48	30
			62	48	30
		(b) 3rd degree			
Co.213	x B.603	,,	14	10	10
B.3365	x B.2935	,,	861	667	571
			875	677	581
		S. sinense			
		(a) 2nd degree			
B.35271	x B.603	,,	46	36	37
B.37226	x B.2935	,,	32	21	10
Ba.11569	x B.35275	,,	0	0	0
			78	57	47

APPENDIX I.—(*Concluded*).

Cross.	Group.	No. Germinations. Nov. 1938-Jan. 1939.	No. Potted. Jan.-Feby. 1939.	No. Planted in field Nursery.
	Mixed Derivation.			
P.O.J.2725 x B.35245	„ „	295	250	170
B.35207 x P.O.J.2878	„ „	1,917	550	420
B.34117 x B.2935	„ „	10	9	0
B.3254 x B.35269	„ „	3	0	0
B.35214 x B.34161	„ „	1	0	0
Co.213 x P.O.J.2878	„ „	33	26	20
B.3365 x P.O.J.2878	„ „	138	136	100
B.37263 x B.H.(10)12	„ „	43	37	30
B.3353 x Co.281	„ „	26	20	0
B.3365 x B.35272	„ „	1,909	1,580	1,322
B.3353 x B.34116	„ „	621	500	470
B.3353 x B.35276	„ „	159	140	120
Ba.11569 x C.P.28/11	„ „	11	0	0
Ba.11569 x B.37261	„ „	26	19	10
		5,192	3,267	2,662
Grand Total		43,270	21,151	15,482

APPENDIX II.

SUGAR CANE FIRST YEAR SEEDLINGS — B.40′ SERIES.

List of Crosses and their Numbers of Seedlings Planted in the Field Nursery (April/May, 1938) and the First Year Seedling Trial (Oct./Nov. 1938).

Group.	Cross.	No. in field Nursery.	No. planted in First Year Seedling Trial.
Noble	Ba.11569 x B.H.10(12)	2,891	1,979
Saccharum	„ x B.603	396	298
officinarum.	„ x B.417	55	45
	B.3013 x B.2935	391	246
	Ba.11569 x B.6835	1,499	849
	„ x Q.813	42	33
	B.3439 x B.H.10(12)	125	90
		5,399	3,540
Nobilisations:			
Saccharum spontaneum — Java:—			
(a) 3rd degree	B.35261 x B.2935	72	46
(b) 4th degree	B.3013 x B.3337	614	306
	B.3274 x B.H.10(12)	161	103
	P.O.J.2722 x B.H.10(12)	79	60
	M.D.47 x B.H.10(12)	425	378
	B.3392 x B.603	82	50
(c) 5th degree	B.3013 x B.34161	101	56
	B.3013 x B.35176	79	60

APPENDIX II.—(*Continued*).

Group.	Cross.	No. in field Nursery.	No. planted in First Year Seedling Trial.
	B.3013 x B.34134	565	201
	B.3172 x B.2935	265	212
	B.3371 x B.2935	72	56
	B.3215 x B.H.10(12)	2,736	1,554
	B.3238 x B.2935	309	228
	B.34137 x B.2935	72	53
	B.3348 x B.2935	109	62
		5,741	3,425
Saccharum Spontaneum — Celebes. (a) 3rd degree	B.35197 x B.2935	78	49
		78	49
Saccharum spontaneum India. (a) 3rd degree	B.3013 x B.35251	366	258
		366	258
Saccharum spontaneum Java — India. (a) 4th degree	B.3238 x B.35253	1,939	998
		1,939	998

APPENDIX II.—(*Concluded*).

Group.	Cross.	No. in Field Nursery.	No. planted in First Year Seedling Trial.
Saccharum barberi.			
(a) 2nd degree	B.3013 x P.O.J.234	186	104
(b) 3rd degree	B.3013 x B.35245	60	49
	Co.213 x B.603	79	61
		325	214
Saccharum sinense			
(a) 1st degree	Uba x B.H.10(12)	3	2
	Kavangire x B.H.10(12)	5	5
(b) 2nd degree	C.H.64/21 x B.H.10(12)	1	1
		9	8
Mixed Derivations	B.3013 x B.35196	150	93
	Ba.11569 x B.35276	9	8
	Co.213 x P.O.J.2878	15	11
	B.3439 x Co.290	328	251
	B.3439 x B.37261	414	275
	C.P.807 x B.3337	144	87
		1,060	725
	Grand Totals	14,917	9,217

APPENDIX III.

REPORT ON A VISIT TO LOUISIANA TO REPRESENT THE STATION AT THE SIXTH CONGRESS OF THE INTERNATIONAL SOCIETY OF SUGAR CANE TECHNOLOGISTS.

New Orleans was reached from Jamaica on Saturday, the 22nd of October. The Conference opened on Monday, the 24th. Tuesday and Wednesday were occupied with excursions to fields and factories in the vicinity of New Orleans. The delegates then left New Orleans on Thursday for a tour through the so-called Louisiana "Sugar Bowl." This included a visit to the Federal Sugar Experiment Station at Houma. On Saturday, 29th October the Conference arrived at Baton Rouge. Until the following Friday, the Conference split up into sections at the Louisiana State University near Baton Rouge and in each section papers were read and discussions ensued. The Conference closed on Friday, 4th November.

2. I attended all excursions which had a sugar cane breeding and field experiment bias and at the sectional meetings at the Louisiana State University attended the meetings of the "Varieties" and "Diseases" sections.

3. I was naturally chiefly interested in sugar cane breeding and seedling selection work. The chief problems in breeding for Louisiana may be categorised as follows:—the production for each of several recognised ecological areas of seedlings with:—

(1) mosaic disease resistance.
(2) resistance to red-rot.
(3) resistance to freezing temperatures and/or the possession of good windrowing properties.
(4) early maturity.
(5) strong ratooning power, and
(6) usual desiderata, such as high cane yield, easily cut (especially with mechanical harvesters) transported and milled and possessing high juice qualities.

4. It is of interest to record that sugar cane does not arrow freely in Louisiana: this applies especially to thick-cane varieties. For this reason, breeding work is done in the Everglades district in southern Florida and either fuzz or seedling cuttings sent to Houma for raising and seedling testing.

5. Early tests are more concerned with the reaction of seedlings to (1) mosaic (2) red-rot and (3) freezing temperatures. Actually, highly specialised techniques have been evolved to note the reactions of seedlings to these selection factors. Susceptibility to any serves to eliminate a seedling.

6. Survivors from these tests are then subjected to early field tests at Houma, then to field trials in the various ecological areas.

7. The work on mosaic disease has shown that no fewer than seven primary strains exist and one of these possesses additional variants. This naturally complicates the problem—a discussion of which would take too long to give here. It only remains to state that the proven existence of such sugar cane mosaic strains is something of which we must take cognisance, more especially in our work for Jamaica.

8. The red-rot investigation work, while chiefly applicable to the rotting of cuttings or setts in the cold temperatures prior to germination, was illuminating in so far as the technique employed was concerned: this having possible application to our own work on red-rot in mature canes.

9. The problem of early maturity is of paramount importance to Louisiana. It has to be noted that planting is done any year, from September to November, then ensues a period of very low temperature, punctuated sometimes by actual freezes, when growth is practically at a standstill. Effective growth is therefore only possible between say, April/May to crop, which starts about October.

10. This comparatively short growing season has tended towards the use as parents and the selection of seedlings of short-growing season types—the typical sub-tropical commercial cane, and the resultant commercial seedlings can scarcely be considered to have any value under West Indian conditions, where the longer-season types are absolutely essential for best field results.

11. The sectional meetings at Baton Rouge were of great interest. Perhaps the most important paper to us was one by the President of the meeting—Dr. E. W. Brandes, on observations on the growth in the United States of America of sugar cane types obtained from several expeditions for wild cane material carried out by the United States Government. I am strongly of the opinion that some of these types would be valuable to our nobilisation work.

12. In conclusion, apart from the direct knowledge gleaned from the excursions and the sectional meetings, the visit was invaluable in providing opportunity to meet and discuss pertinent problems with delegates engaged in sugar cane breeding and field experiment work throughout the world.

13. The visit emphasised the diversity of the sugar cane breeding problems and the necessity for adopting variants of general principles suited to local conditions to get the best results.

A. E. S. McINTOSH,
Geneticist.